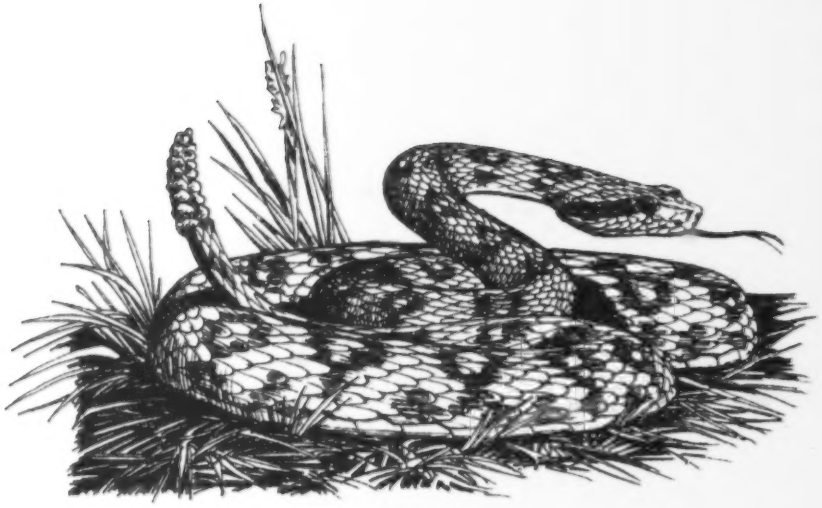
Fish & Wildlife Division

BIODIVERSITY AND SPECIES AT RISK SECTION

Lethbridge Rattlesnake Conservation Project: 2003 Progress Report



Alberta Species at Risk Report No. 81

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Lethbridge Rattlesnake Conservation Project: 2003 Progress Report

Reg Ernst

Alberta Species at Risk Report No. 81

February 2004

Publication No. I/137
ISBN: 0-7785-2958-4 (Printed Edition)
ISBN: 0-7785-2959-2 (On-line Edition)
ISSN: 1496-7219 (Printed Edition)
ISSN: 1496-7146 (On-line Edition)

Illustration by: Brian Huffman

For copies of this report, contact:

Information Centre- Publications
Alberta Environment/ Alberta Sustainable Resource Development
Main Floor, Great West Life Building
9920- 108 Street
Edmonton, Alberta, Canada T5K 2M4
Telephone: (780) 422-2079

OR

Visit our web site at:
http://www3.gov.ab.ca/srd/fw/riskspecies/

This publication may be cited as:

Ernst, R.D. 2004. Lethbridge rattlesnake conservation project: 2003 progress report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 81, Edmonton, AB. 11 pp.

EXECUTIVE SUMMARY

Conservation efforts for the prairie rattlesnake (*Crotalus viridus viridus*) in Lethbridge were initiated in 2000 and continued through 2003. The focus has been on educating the public to reduce human/snake conflicts and on the capture and moving of problem and vulnerable rattlesnakes to more secure habitat.

During the summer of 2003, twenty-three rattlesnakes were captured and moved to the Cottonwood Park hibernaculum and another was captured and moved to Popson Park. Passive integrated transponder (PIT) tags were implanted in the captured rattlesnakes for long-term identification and monitoring. Telemetry transmitters were attached externally to the rattles of eight rattlesnakes prior to their release. Subsequently, rattlesnake dispersal, movements, and habitat use were monitored using radio telemetry. Due to problems with the radio transmitters staying attached, a very limited amount of movement data was collected.

Data collected was used to test the hypothesis that if rattlesnakes hibernate successfully at the artificial hibernaculum in Cottonwood Park, they will adopt Cottonwood Park as their home range and return in subsequent years to hibernate. Results indicated that 3 of the 8 rattlesnakes released from the Cottonwood Park hibernaculum in spring 2003 returned to the enclosure in the fall. This was similar to results of 2002.

Continued efforts to provide public education, respond quickly to calls for problem rattlesnake removal, and to maintain the participation and cooperation of all interested groups and citizens will be necessary for conserving a prairie rattlesnake population in Lethbridge.

ACKNOWLEDGEMENTS

Following is a list of the many people and organizations I would like to thank for their support and help with this project.

- Alberta Conservation Association's Wildlife Management Enhancement Fund for providing funding for this project.
- The Alberta Fish and Wildlife Species at Risk Program for providing funding.
- Richard Quinlan (Alberta Fish and Wildlife Species at Risk Biologist) for securing funding, project administration, and report editing.
- Randy Lee (Regional Manager – Alberta Conservation Association) for contract management and volunteering to help in the capture and removal of problem rattlesnakes.
- Kathryn Romanchuk (Alberta Fish and Wildlife) for report editing and formatting.
- Conservation officers (Alberta Fish and Wildlife) for their support of the project.
- Rod McFarlane (DVM) from the Highlands Pet Hospital for providing veterinary services to implant PIT tags and physically examine captured rattlesnakes.
- Staff at the Lethbridge Agriculture Research Station vivarium for the many lab mouse carcasses they provided to feed the rattlesnakes.
- Ron Bain and Runner's Soul sports store for continued support and for fund raising and providing a venue at the Coulee Cactus Crawl for distributing educational material.
- Paradise Canyon Land Corporation for cooperating in the project.
- Rick Williams (Parks Steward – City of Lethbridge) for having signs constructed and installed at Cottonwood Park and for his continued support of the program.
- Shawna Cook and staff at the Helen Schuler Coulee Centre for their continued support of the program.
- All the volunteers who helped in surveying Cottonwood Park for rattlesnakes.
- Darius Maynes (Lethbridge Summer Park Ranger) for his help with the project including educating and surveying park users.
- John Nightingale (DVM) for PIT tag implanting and for his help in surveys of Cottonwood Park.
- Citizens of Lethbridge for their continued support of the conservation project.

TABLE OF CONTENTS

Executive Summary i
Acknowledgements ii
1.0 Introduction 1
2.0 Methods 1
2.1 Public Education 1
2.2 Reduction of Human/Snake Conflicts 1
2.3 Maintenance of Rattlesnakes at the Artificial Hibernaculum 1
2.4 Rattlesnake Handling and Radio Telemetry 2
3.0 Results 2
3.1 Public Education 2
3.2 Reduction of Human/Snake Conflicts 3
3.3 Maintenance of Rattlesnakes at the Artificial Hibernaculum 3
3.4 Radio Telemetry and Transmitter Effectiveness 4
3.5 Dispersal and Habitat Use 5
3.5.1 Cottonwood Park Den Fidelity 5
3.6 Mating and Courtship Activities 5
3.6.1 Reproduction 6
3.7 Newly Discovered Hibernaculum 6
4.0 Discussion 6
4.1 Transmitter Effectiveness 6
4.2 Cottonwood Park Den Fidelity 6
4.2.1 Upcoming Rattlesnake Release and Hibernaculum Monitoring 7
4.3 Mating and Courtship Activities 7
4.4 Popson Park Hibernacula 8
4.5 Research Opportunities 8
5.0 Future Conservation Strategies/recommendations 8
6.0 Recommendations for 2004 9
7.0 Literature Cited 10
8.0 Appendices 11
Appendix A. 2003 Rattlesnake Captures, Deaths, and Investigations 11

LIST OF TABLES

Table 1. Interior and exterior temperatures at the Cottonwood Park hibernaculum (winter 2002/2003) 4

1.0 INTRODUCTION

In 2000, a management and recovery plan was completed to address issues concerning the future of a small population of prairie rattlesnakes (*Crotalus viridus viridus*) in Lethbridge (Ernst 2002). In 2001 the Lethbridge Rattlesnake Conservation Project was initiated to implement conservation strategies outlined in the management plan. In 2001 an artificial hibernaculum was constructed in secure parkland in Cottonwood Park. . Since that time conservation efforts have focused on educating the public to reduce human/snake conflicts, the prompt removal of problem and vulnerable rattlesnakes to more secure habitat away from urban development, and maintaining the participation and cooperation of all interested groups and citizens.

During the 2001, 2002, and 2003 seasons all problem and vulnerable rattlesnakes captured in urban areas were moved and maintained at the Cottonwood Park site until their release the following spring. PIT (passive integrated transponder) tags were implanted in captive rattlesnakes for long-term identification and monitoring. Telemetry transmitters were attached externally to selected rattlesnakes prior to release in order to collect data on their movements and subsequent habitat use.

Throughout the project, the effectiveness of using externally attached transmitters for radio-tracking rattlesnakes was being evaluated. Telemetry monitoring was initiated to determine whether rattlesnakes that successfully hibernated at the artificial hibernaculum would return to the artificial den to hibernate in subsequent years. This report summarizes conservation efforts initiated in 2001 and continued through 2003. For complete details on the Lethbridge Rattlesnake Conservation Project's goal, objectives, and results from previous years' work refer to Ernst (2003).

2.0 METHODS

2.1 Public Education

The public education component of the project was carried out through production and distribution of brochures, poster displays, and tours of the artificial hibernaculum. A survey of park users was carried out to gauge public attitudes towards the program. Radio, television, newspaper, and magazine interviews were done. A website was developed for the project

2.2 Reduction of Human/Snake Conflicts

A drift fence (Popson Park drift fence) with traps was established to capture snakes moving towards a residential area and move them to a secure area. Interpretive signs were produced and installed in parks to provide information on preventing encounters with rattlesnakes. Requests for snake removals were responded to promptly.

2.3 Maintenance of Rattlesnakes at the Artificial Hibernaculum

Mouse and ground squirrel carcasses were fed to rattlesnakes throughout the spring and summer, usually at weekly intervals. One carcass was provided for each rattlesnake and if

all carcasses were consumed promptly, a fresh supply was provided. Water was available as required.

During initial construction of the hibernaculum temperature probes were installed in the two winter chambers to allow monitoring of interior temperatures. This monitoring has continued to determine whether the winter chambers provide temperatures within the range tolerated by hibernating rattlesnakes. It also allows for evaluation of the relationship between warming spring temperatures, den temperatures, and spring emergence of rattlesnakes.

2.4 Rattlesnake Handling and Radio Telemetry

Rattlesnakes captured during 2002 were forced to hibernate at the Cottonwood Park hibernaculum during winter 2002/2003 by confining them to an enclosure surrounding the den entrance. Rattlesnakes were recaptured during the spring of 2003, fitted with transmitters, and implanted with PIT (passive integrated transponder) tags. Holohil transmitters purchased from a manufacturer in eastern Canada were attached to the rattle of 2 snakes using 5-minute epoxy and tape. The other six rattlesnakes were fitted with Mini transmitters (locally manufactured) using a different type of glue

Rattlesnakes were captured using snake tongs and traps and were restrained using a noose. PIT tags were implanted subcutaneously about 6 cm anterior to the cloaca using a 12-gauge syringe. Following the release of transmitter-fitted rattlesnakes, radio telemetry was used to track dispersal from the Cottonwood Park hibernaculum (release site) and subsequent habitat use. Additionally, random sweeps of the park were done on a regular basis and three organized sweeps involving several individuals were done in late summer.

3.0 RESULTS

3.1 Public Education

Rattlesnake brochures and information sheets outlining conservation efforts were provided to staff at the Paradise Canyon Golf Resort for distribution in the Paradise Canyon newsletter. Similar material was hand-delivered within the Riverstone and Mountain View subdivisions, which are adjacent to rattlesnake habitat. Rattlesnake brochures were made available to the public year-round at the Lethbridge Public Library, Helen Schuler Coulee Centre (HSCC), and the Alberta Fish and Wildlife office. Several tours to the Cottonwood Park hibernaculum were provided to interested groups.

A project poster was displayed at the Lethbridge Public Library, City Hall, the HSCC, and at the annual Coulee Cactus Crawl. A verbal presentation was also given at the Coulee Cactus Crawl. The summer park ranger employed by the City of Lethbridge distributed information on the Lethbridge population of prairie rattlesnakes and conducted a survey in Popson and Cottonwood Parks to determine the public's attitude towards conservation efforts of rattlesnakes in the city. This survey indicated that more than 90% of park users supported the Lethbridge Rattlesnake Conservation Project. In October 2003, researchers and managers from western North America presented information on rattlesnake conservation and ecology during a two-day reptile symposium

held at the University of Lethbridge. Radio and television interviews leading up to and during this symposium provided additional opportunities to educate the public about conservation of Lethbridge rattlesnakes. Discussions took place with citizens from the Paradise Canyon subdivision and with park users in Cottonwood and Popson Parks. All requests for information were responded to and media interviews were granted when requested.

A website <urbanrattlesnakes.com> was developed as a means of educating the public about the Lethbridge Rattlesnake Conservation Project. Canadian Geographic magazine has prepared an article on prairie rattlesnakes, which includes information about this project.

3.2 Reduction of Human/Snake Conflicts

In 2003, no rattlesnakes were captured in the traps set up along the Popson Park drift fence. A total of 16 captures and removals were made from subdivisions, roads, and private property. All these snakes were released at the artificial hibernaculum located in Cottonwood Park (Appendix A). Seven other rattlesnakes that were considered "vulnerable" were also relocated to the hibernaculum. There were 5 reported road kills, but only one from the Paradise Canyon Road (Appendix A).

There were no reports of human-caused rattlesnake mortality, but on July 3, 2003 two men trespassed into the Cottonwood Park artificial hibernaculum. They had climbed over the chain link fence and captured a rattlesnake within the enclosure. Other park users observed them walking from the site carrying a bucket containing a rattlesnake. When they were confronted and challenged by the diligent citizens, and advised of the illegality of their actions, they released the rattlesnake beside the Cottonwood Park parking lot. The Lethbridge District office of Alberta Fish and Wildlife was informed of this incident.

3.3 Maintenance of Rattlesnakes at the Artificial Hibernaculum

The adult rattlesnakes within the Cottonwood Park enclosure readily consumed mouse and ground squirrel carcasses and occasionally drank water. An attempt to feed young "pinkie" mouse carcasses to neonate rattlesnakes was only marginally successful because adult rattlesnakes often consumed the baby mouse carcasses before the neonates had a chance to locate them.

Temperature probes within the three winter chambers at the hibernaculum allowed monitoring of interior temperatures, however the temperature probe in chamber 3 (southwest chamber) failed in late July so no late season data was available for it.

Interior den temperatures lagged well behind falling and rising outside ambient temperatures (Table 1). The coldest chamber temperatures were recorded in late winter/early spring, several weeks later than the lowest outside temperatures. The warmest chamber temperatures were recorded in late summer/early fall after having several weeks of daytime highs of greater than +30° C (Table 1). Short-term fluctuations in outside air temperatures have little impact on interior chamber temperatures.

In 2003 the first rattlesnake emerged on March 20 when the interior temperature was 4.6° C, which was the lowest temperature recorded for that chamber during the 2002/2003 winter. Outside air temperature at the time was 15° C. Several more rattlesnakes were observed on March 31. In general, the spring of 2003 was considered average in terms of temperature and precipitation.

Table 1. Interior and exterior temperatures at the Cottonwood Park hibernaculum (winter 2002/2003).

Date	Chamber 1 (North) Interior	Chamber 2 (South) Interior	Chamber 3 (Southwest) Interior	Exterior Temp.
27/10/02	12.9	9.6	N/a	9
01/11/02	12.1	8.9	N/a	3
15/11/02	10.9	8.5	8.7	12
30/01/03	6.2	4.1	N/a	N/a
25/02/03	5.5	3.1	1.1	N/a
20/03/03*	4.6	N/a	3.1	3
30/03/03	5.7	N/a	7.1	16
31/03/03	5.8	5.9	N/a	15
08/04/03	6.5	6.3	7.1	17
20/04/03	7.3	7.9	8.6	13
16/05/03	8.6	9.9	10.2	10
21/05/03	8.9	10.1	10.7	15
27/07/03	15.6	18.1	N/a**	32
03/09/03	16.8	17.5	N/a	33
20/09/03	16.3	16.4	N/a	17
08/10/03	15.8	16.3	N/a	21
25/10/03	14.2	13.9	N/a	17
08/11/03	11.7	9.2	N/a	-5

Note: All temperatures in degrees Celsius
* First snake seen at den entrance. ** Thermometer failed.

None of the neonates born at the Cottonwood Park hibernaculum in 2002 were observed in the spring of 2003; however, at least 3 of the neonates died shortly after birth so the lack of survival is likely not related to den temperature.

3.4 Radio Telemetry and Transmitter Effectiveness

The Holohil transmitters that were attached to one adult female and one adult male rattlesnake using 5-minute epoxy and tape stayed on the female for 45 days and only detached from the male when he was run over on the Cottonwood Park road (about 45 days after application). None of the locally manufactured Mini transmitters attached to 6 rattlesnakes using a different type of glue stayed on long enough to collect any meaningful data during 2003.

3.5 Dispersal and Habitat Use

All of the rattlesnakes at the Cottonwood Park hibernaculum were released in May of 2003 except for 5 females. The females were held back because at least some of them were thought to be gravid.

Because the majority of radio transmitters failed to stay attached, dispersal and habitat use data was available from only 2 of the 8 rattlesnakes that were fitted with transmitters in spring 2003. The transmitter-equipped male travelled to the floodplain and took cover under deadfall in the cottonwood forests near the Oldman River until the onset of mating season in early July. He then joined the transmitter-equipped female on an upland site in the northwest area of Cottonwood Park. He remained with the female for several days before travelling to the Cottonwood Park road where he was road-killed.

The transmitter-equipped female travelled about 300m in 24 hours to the western boundary of the park. She was captured on the edge of private property and re-released at the Cottonwood park hibernaculum. She then travelled to the northwest area of the park and remained on the upland for about 6 weeks. Contact was lost when her transmitter detached in a ground squirrel burrow. During the first two weeks of July, she was observed with at least 3 different males, one of them unmarked.

In addition to our radio telemetry observations, we encountered rattlesnakes at 12 different locations. At least 8 of these rattlesnakes were unmarked. Two of the rattlesnakes encountered during the sweeps were juveniles, perhaps from the clutch of neonates born at the Cottonwood Park hibernaculum in 2001. Some of the unmarked rattlesnakes may be immigrants, but others may be from the potential natural hibernaculum discovered in September of 2003. That site contained both marked and unmarked rattlesnakes, but no neonates were observed. PIT tags proved effective in identifying rattlesnakes that had been relocated to Cottonwood Park.

3.5.1 Cottonwood Park Den Fidelity

Three of the rattlesnakes released from the Cottonwood Park hibernaculum in May 2003 are known to have returned; at least two of the rattlesnakes returned to the hibernaculum during mid-summer. A third rattlesnake observed outside the pen trying to get in was placed within the enclosure. Two of the returnees were known to be males and likely returned to mate with the females in the pen.

Two male and 4 female rattlesnakes were captured in Cottonwood Park and on adjoining private land and returned to Cottonwood Park. Three of the 6 rattlesnakes were captured near the scenic lookout in Cottonwood Park, 2 were captured about 50m west of the hibernaculum, and the sixth was captured on private land west of the park.

3.6 Mating and Courtship Activities

Starting in early July until early September, mating and courtship activities were observed on a regular basis. Most of the activity took place within the enclosure at the Cottonwood Park hibernaculum, but pairs of rattlesnakes were observed at 3 other

locations in Cottonwood Park. Most of the activity was observed on east-facing slopes within 200m of the hibernaculum. Of the 9 rattlesnakes engaged in mating activities outside of the hibernaculum, 5 were marked with PIT tags.

3.6.1 Reproduction

In 2003, there were two clutches of neonates born at the Cottonwood Park hibernaculum. The first clutch was born on August 20 and the second a few days later. Observations indicate that at least two clutches of neonates were born at the hibernacula in Popson Park around the same time. This is in contrast to 2002 when the neonates were born in October both at Cottonwood Park and at Popson Park. This difference is likely accounted for by the difference in temperatures over the two summers (2002 was cool and cloudy compared to 2003 which was hot and sunny). None of the neonates born in 2002 have been observed at any of the hibernacula in Cottonwood and Popson Parks.

3.7 Newly Discovered Hibernaculum

Garter snakes (*Thamnophis sp.*) have been observed in Cottonwood Park over the past couple of seasons, but several searches in the area where they were observed failed to reveal a hibernaculum. However, in late September of 2003, the hibernaculum was located. In addition to garter snakes, at least 6 rattlesnakes were present at the den. Prior to the realization that this was a hibernaculum, three of these rattlesnakes had been moved to the artificial den. The rattlesnakes were relocated because of the proximity of the natural den to a main trail in Cottonwood Park. This natural hibernaculum in Cottonwood Park is considered an important discovery because at least 3 of the rattlesnakes observed in the vicinity of the den were marked with PIT tags. From this, we may conclude that relocated rattlesnakes can find alternate denning sites when they exist. This also provides us with increased optimism about the long-term success of the Lethbridge Rattlesnake Conservation Project.

4.0 DISCUSSION

4.1 Transmitter Effectiveness

The Holohil transmitters that were attached externally to 2 rattlesnakes using 5-minute epoxy and tape proved effective at radio- tracking rattlesnakes over the short to mid-term (45 days), but the six Mini transmitters that were attached using a different type of glue failed to stay on long enough to collect any meaningful data. Experience has shown that 5-minute epoxy is effective at bonding the transmitter to the rattle, so having used the other glue for transmitter attachment on the majority of the rattlesnakes may account for some of the problem.

4.2 Cottonwood Park Den Fidelity

Three of 8 rattlesnakes released from the Cottonwood Park hibernaculum in spring 2003 are known to have returned, however, it is possible that some snakes returned to the den and remained undetected in one of the tunnels or chambers. PIT tags were checked on a regular basis, but only the snakes that were moving around within the enclosure were

accessible. If some did return undetected, they will be accounted for during the spring 2004.

During the summer of 2003, we located at least 5 rattlesnakes that had been captured and contained in 2001 and released in May of 2002, but that were not observed at the Cottonwood Park hibernaculum during the autumn of 2002. These rattlesnakes were either undetected at the hibernaculum or found an alternate site at which to hibernate during the winter of 2002/2003. We are encouraged by these observations because we assume that those rattlesnakes (relocated to Cottonwood Park in 2001) have made Cottonwood Park their home even though we are not certain where they hibernated. If that is so, it bodes well for our conservation efforts.

Nowak et al. (2002) suggest that rattlesnakes may be discouraged from using areas of high human activity. For various reasons, there is considerable human activity at the Cottonwood Park hibernaculum. This may be a factor in preventing rattlesnakes from returning to the artificial den to hibernate.

4.2.1 Upcoming Rattlesnake Release and Hibernaculum Monitoring

In May 2004, all of the captured rattlesnakes will be released from the artificial hibernaculum in Cottonwood Park; we will attempt to capture and mark all of the rattlesnakes at the den prior to release. As well, rattlesnakes captured in the future will no longer be contained at the artificial facilities in Cottonwood Park. The enclosure fence will be open along the bottom to allow snakes free access to the hibernaculum. The den will be monitored over the summer and fall of 2004 to determine how many rattlesnakes (if any) are using it. The number of rattlesnakes present at the hibernaculum in the autumn of 2004 will be a good estimate of the degree to which they have bonded to the artificial facilities because any rattlesnakes observed there will either be returnees or rattlesnakes that elected to stay at the hibernaculum over the summer (*i.e.* gravid females). Implanted transmitters planned for 2004 should yield season-long data about rattlesnake use of habitat in Cottonwood Park.

4.3 Mating and Courtship Activities

The 4 unmarked rattlesnakes observed engaging in mating activities outside of the Cottonwood Park hibernaculum indicate that immigration into Cottonwood Park is taking place, that there is a resident group of rattlesnakes in Cottonwood Park, or perhaps both.

Duvall and Schuett (1997) found that males searching for receptive females were most successful by straight-line movement, presumably until they crossed a pheromone trail left by the female. They would then follow the (terrestrial) pheromone trail until they located the female and engage in courtship activities. In 2003, a transmitter-equipped male travelled about 700m over a few days to locate a stationary female. Two other males located this female as well. This may indicate the possibility of airborne pheromones. More research needs to be done to determine how males locate receptive females.

4.4 Popson Park Hibernacula

The 2 known hibernacula at Popson Park were monitored to gather information on spring and fall migration times and directions, to determine population demographics, and to determine if any neonates were born. In 2003, spring migration was initiated in early May and snakes started to arrive back at the hibernacula around mid-September. Neonates were observed at both hibernacula in late August.

A census done at Popson Park in early October 2003 resulted in 10 rattlesnake observations at both the rim and slope hibernacula (total of 20 observations). There seems to be fewer rattlesnakes at the rim hibernaculum than in the past, but achieving an accurate count is very difficult. Rattlesnakes may go unnoticed because of their cryptic nature and because some of them may be in burrows when the site is visited. Because of all the snake removals from the Paradise Canyon area over the 3-year life of the project (and earlier), it would not be surprising if there were fewer rattlesnakes in Popson Park.

4.5 Research Opportunities

In addition to previously mentioned research opportunities (Ernst 2003), it would be valuable to investigate if rattlesnakes are attracted to urban areas (*e.g.* prey species present) or if the urban areas merely act as a barrier across their normal migration routes. If they are attracted to urban areas, determine what can be done to render the developed areas less attractive to the rattlesnakes.

5.0 FUTURE CONSERVATION STRATEGIES/RECOMMENDATIONS

This suggestion may seem to contradict project objectives (see Ernst 2003), but some consideration should be given to constructing an artificial hibernaculum at a site in Popson Park that receives very little human use (such sites do exist). The main Popson Park hibernaculum is situated in an area that receives considerable human use and is therefore vulnerable to human persecution and disturbance. Particularly at risk is a group of Popson Park rattlesnakes because future subdivisions are planned within metres of their hibernaculum. If problem rattlesnakes could be relocated to a relatively secure site in Popson Park, it would provide more time to enhance and properly evaluate relocation efforts to Cottonwood Park. Maintaining a population of rattlesnakes in Popson Park until such time as effective methods of relocating them to Cottonwood Park can be developed and implemented is important to achieving the project goal.

If the rattlesnakes relocated to Cottonwood Park show fidelity towards the artificial hibernaculum, consideration should be given to constructing a second, unmarked, artificial hibernaculum in the southwest corner of the park. This part of the park receives very little use. Rattlesnakes denning at more than one site should have a greater level of security versus having them all concentrated at one location.

If conservation efforts are successful and the population of rattlesnakes in Cottonwood Park reaches a level where they begin to conflict with adjacent landowners, mitigation measures must be taken to minimize this conflict. Barrier fencing and traps must be installed along the park boundary; it will be necessary to patrol the fence and relocate the

trapped rattlesnakes back to the Cottonwood Park hibernaculum. The summer park ranger, a graduate student, or both could do this.

6.0 RECOMMENDATIONS FOR 2004

- Continue with the education and coordination activities initiated in 2001.
- Continue to capture, mark, relocate, and release problem and vulnerable rattlesnakes.
- Capture and mark all rattlesnakes at the Cottonwood Park hibernaculum prior to release during the spring of 2004.
- Starting in 2004, rattlesnakes will no longer be contained at the artificial hibernaculum in Cottonwood Park; however, the enclosure fencing should be retained to provide a greater level of security for rattlesnakes using the facility. The enclosure fencing would help prevent natural and human predation. Two youths were observed in Cottonwood Park during 2003 with a pellet gun. Without the enclosure fence to act as a barrier, they could easily cause major damage to the rattlesnakes using the den.
- Investigate the feasibility of developing a corridor between Popson and Cottonwood Parks. Allowing rattlesnakes to move between the 2 parks along a landscape linkage away from human disturbance would reduce human/snake conflict, enhance existing habitat features, and should increase gene flow.
- Implant transmitters in 3 adult male rattlesnakes prior to release in the spring of 2004.
- Implant PIT tags and attach transmitters to rattlesnakes captured in areas such as the U of L. Release the rattlesnakes as close to the point of capture as possible and monitor their movements to determine their home range.
- Using radio telemetry and other methods, monitor rattlesnake movements and activities during the summer of 2004.
- If necessary, install fencing and traps at the east end of Cottonwood Park to intercept migrating rattlesnakes. Release (do not contain) any captured rattlesnakes back at the Cottonwood Park hibernaculum.
- Allow the existing population of rattlesnakes to remain in Popson Park until development or other factors make it no longer practical to do so.
- During the summer of 2004, do sweeps of Cottonwood Park and surrounding area to try and locate rattlesnakes. The observations will provide insight into how rattlesnakes (both marked and unmarked) are using the habitat in Cottonwood Park
- A natural hibernaculum was discovered in Cottonwood Park near the lookout the City installed on the way down to the floodplain. To provide a greater level of security for the natural den, the lookout should be removed and the developed trail adjacent to the den should be reclaimed to direct park users away from the denning site; however, nothing should be done that might draw attention to the den.
- Continue to monitor rattlesnake activities on the private lands adjoining Cottonwood Park. If landowners do experience problems associated with current

conservation efforts, then mitigation measures must be identified. These may take the form of fencing and traps (and monitoring) along conflict points.

7.0 LITERATURE CITED

Duvall, D. and G.W. Schuett. 1997. Straight-line movement and competitive mate searching in prairie rattlesnakes, *Crotalus viridis viridis*. Animal Behaviour. 54: 329-334.

Ernst, R.D. 2002. Management and recovery strategies for the Lethbridge population of the prairie rattlesnake. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 40. Edmonton, AB.

Ernst, R.D. 2003. Lethbridge Prairie Rattlesnake Conservation Project: 2002/2003 Progress Report. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 64. Edmonton, AB.

Nowak, E.M., T. Hare, and J. McNally. 2002. Management of "nuisance" vipers: effects of translocation on western diamond-backed rattlesnakes (*Crotalus atrox)*. IN: G.W. Schuett, M. Hoggren, M.E. Douglas, and H.W. Greene (Eds.), Biology of the Vipers. Eagle Mountain Publishing, LC.

Watson, S.M. and A.P. Russell. 1997. Status of the Prairie Rattlesnake (*Crotalus viridis viridis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 6, Edmonton, AB. 26 pp.

8.0 APPENDICES

Appendix A. 2003 Rattlesnake Captures, Deaths, & Investigations

Date	Location	Action
19/04/03	Bickman Property	Caught 1 adult & released in CP enclosure.
01/05/03	Bickman Property	Caught 1 mature adult and 1 young adult and released in CP enclosure
01/05/03	Popson Park	Caught 1 adult on road about 100 m south of Popson Park turnoff and released in CP enclosure.
06/07/03	Cottonwood Park	Captured 2 (#6691 & #7691) on slope west of hibernaculum and released in enclosure.
08/06/03	Cottonwood Park acreage	Fish & Wildlife captured 1 adult (marked green) and released in CP enclosure. It was captured on acreage at east end of Cottonwood Park.
14/06/03	Paradise Canyon subdivision	Summer Park Ranger captured 1 adult and released at Cottonwood Park enclosure.
30/06/03	Riverstone subdivision	Fish & Wildlife caught 1 adult and released @ CP enclosure.
03/07/03	Pavan Park and Par 3 area	Report of rattlesnake seen at both locations.
30/07/03	Hubbard Property	Caught 1 young adult in machine shed and released at Cottonwood Park enclosure.
02/08/03	Bridgeview RV Park	Caught a large adult under RV (10 PM) and released @ CP enclosure (marked red).
12/08/03	Paradise Canyon subdivision	Two adults caught in garden netting (9:30 PM). Freed them from netting and released at Cottonwood Park enclosure.
13/08/03	Paradise Canyon subdivision	Two more adults caught at same location as previous entry. One freed from garden netting; both released at Cottonwood Park enclosure.
19/08/03	Scenic Heights	Caught an injured rattlesnake (young adult) at apartment complex. Rod McFarlane preformed surgery but snake died at the Cottonwood Park enclosure.
23/08/03	Cottonwood Park	Caught 1 juvenile by rock on upland site and released at Cottonwood Park enclosure. Appeared to be in poor shape.
04/09/03	Hubbard Property	Caught 1 of our females (#446) at south end of yard and released at the Cottonwood Park enclosure.
10/09/03	Cottonwood Park	Caught 1 juvenile below red shale trail east of hibernaculum and released in enclosure. May be one of our 2 year olds. Caught during sweep of park.
22/09/03	Cottonwood Park	One neonate killed along red shale path.
23/09/03	Popson Park road	One adult captured and released at the Popson Park rim hibernaculum.
22/09/03*	Cottonwood Park lookout	Caught 1 female (#5795) and released in Cottonwood Park enclosure.
24/09/03*	Cottonwood Park lookout area	Caught 2 and released at enclosure. One was #7286.
26/09/03*	Cottonwood Park lookout	Caught 1 more female (#2772) and released in Cottonwood Park enclosure.
03/10/03	Paradise Canyon subdivision	Responded to call in Paradise Canyon to remove rattlesnake in yard, but gone by the time I arrived (~15 min).